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ABSTRACT

The purpose of this study was to examine the effects of computer location on first grade students' enjoyment and usage of computers. A large difference was found concerning time spent on computers between in-class and computer lab settings. In-class computer students spent three times as long on computers as computer lab students during the three week recording period. All students were surveyed on computer enjoyment. Survey results indicated that computer lab students wanted greater access to computers, while more in-class computer students believed their class used the computer every day. In addition, in-class students believed more strongly in the role that computers played in helping them learn. Future recommendations concerning computers and education are suggested. (Author)

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Running Head: The Effects of Computer Location

The Effects of Computer Location on First Graders' Usage and Enjoyment of Computers

University of Virginia
Master's Thesis Project

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May 5, 1998

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Abstract

The purpose of this study was to examine the effects of computer location on first grade students' enjoyment and usage of computers. A large difference was found concerning time spent on computers between in-class and computer lab settings. In-class computer students spent three times as long on computers as computer lab students during the three week recording period. All students were surveyed on computer enjoyment. Survey results indicated that computer lab students wanted greater access to computers, while more in-class computer students believed their class used the computer every day. In addition, in-class students believed more strongly in the role that computers played in helping them learn. Future recommendations concerning computers and education are suggested.

Introduction

As the American public school system continues to move towards advanced technology integration, the issue of effective computer implementation has arisen. Just recently on November 17, 1997, the Wall Street Journal published an article: *Technology: What We've Learned,* an article that describes insufficiencies in school computer lab designs and the need for computer location within the classroom framework. Currently, researchers are growing cognizant of the fact that computer labs are depriving students of proper and extensive exposure to computers and computer software. Therefore, the main concern of researchers, school administrators, and staff has become finding the most advantageous placement of computers within the school setting. While new research has highlighted the success of computer integration within the classroom, supporters of labs reject this costly alternative. They argue that labs offer highly qualified lab technicians that can assist sometimes under trained classroom teachers. In-class computer proponents, on the other hand, contend that classroom computers have been correlated to significant academic success as well as a student body that feels a sense of "control in their learning process" (Whitehead, 1993, p.40).

Need

Through examining the effects of computer placement in both computer lab and in-class settings, schools can gain insight into which implementation offers the most promise for students in the technological realm. This research will give educators a stronger

understanding of how to most efficiently utilize computer activity time and determine which setting appeals most to their students.

Purpose

This research project was executed to determine which computer setting offers first grade students and teachers the most instructional time and enjoyment in computer activities. The specific research questions that were examined in the study included:

1. Do first grade students spend more time on content related activities in an in-class computer setting or a computer laboratory setting?
2. Does computer setting context (in-class vs. computer lab) influence first graders' enjoyment of computers?

Some Definitions

The following operational terms and definitions will be used throughout the four chapters of this study :

In-class computers refer to those computers that exist within the classroom framework. The in-class computers discussed in this study are located in 2 kindergarten/first grade combined classrooms at Woodbrook Elementary School in Charlottesville, Virginia.

Computer lab refers to a room that houses many computers outside of the classroom orientation. The computer lab mentioned in this study is located in Burnley-Moran Elementary School in Charlottesville, Virginia.

On-task refers to those students who are working on relevant computer lesson materials while quietly sitting in their seats.

Off-task refers to those students who are working on non-related computer lesson material, out of their seat, or exhibiting other disruptive behaviors.

Instructional time refers to the amount of time, during a computer lab period, that an instructor spends delivering a lesson. This time excludes transitions into and out of the computer lab.

Lab/teaching assistants refer to the two assistants proctoring the computer lab activities and lessons at Burnley-Moran Elementary School.

Data collection period refers to the three week period where each researcher collected the amount of time students spent using the computers in their specific setting.

Log-in sheets refer to the sheets each researcher used to record the amount of time each student was spending on the computer each week.

Hypotheses

The researchers hypothesize to show that student participants in this study will express enjoyment in both types of computer settings as long as they have constructive support and a sense of control over their learning environment. The study's data are expected to show an advantage in in-class computers in areas of student usage and actual time spent weekly in school on computers.

Overview

In the following chapter, current literature discussing the advantages of in-class computer use versus computer lab implementation will be reviewed. The literature will also detail student enjoyment of computer use as well as issues concerning

computer usage and time. In chapter three, a description of the study's methodology in both computer settings will be presented as well as a separate methodology for the implementation of a nine item survey on student enjoyment of computers. The three separate methodologies will explain the instrumental design of the study, data collection procedures, and data scoring. Chapter four will analyze data, discuss results, and offer ideas for future research. The appendix contains data collection instruments, a sample survey and graphs.

Literature Review

The recent strides in technology integration at the elementary level have been immense. Computers in schools are no longer a luxury enjoyed by the wealthiest school districts, but a reality for all schools nationwide. The numbers of computers per school is rapidly growing along with increased attention on faculty technology training. Software and computer related materials are expanding in both quantity and quality, allowing some teachers to smoothly blend computer use with lessons across curricular areas. Even with the general appreciation and acceptance of computers in schools, there remain many controversies surrounding effective computer use and computer location. The following literature review will as well as the literature related to student attitudes towards computer use. The impact of time students spend on computers, as a major contributing factor to student enjoyment and skill attainment, will also be addressed.

As the number of computers in schools steadily climbs, the issue of computer location has come to the forefront of technological concerns. There exists a division over whether computer labs or in-class computer integration is best for the use of computers as an educational tool. Proponents on both sides see the value in each strategy, but claim the strength of their argument comes from the weaknesses of the other.

In-class Computer Use

The argument for the classroom integration approach is compelling as it uses, for its premise, the idea that the computer should be a piece of the classroom design in order for it to be used as an effective educational tool. Researchers pinpoint the academic, social and management advantages of computer integration in the classroom.

Proponents of computer integration emphasize the educational benefits within the elementary setting. Students in computer equipped elementary classrooms have excelled in areas such as math and writing (Whitehead, 1994) and students in computer networked classrooms were found to have raised their test scores an average of 22 percentile points (Whitehead, 1993). The academic success of these students continued into high school often placing them on honor roll (Whitehead, 1993). Other schools have found success through classroom computer use in reading comprehension and writing. Teachers at these schools claim that students are not only improving in language arts, but are achieving growth as "independent learners" (Whitehead, 1993, p.34).

There are a number of academic advantages of the computer integration approach. Researchers state that classroom computers allow students to gain a sense of "control in their learning process" (Kepner, 1986, p.40). This is due to the convenient location of the computer as well as the individualized aspect of computer programs; students are or believe they are teaching themselves. The student is also receiving positive reinforcement by the consistent interaction

and continued immediate feedback that a computer offers (Kepner, 1986). It is impossible for teachers to attend to all their students' needs all the time and the computer can add as a temporary replacement to help facilitate learning.

Teachers find the integration method useful because of the large amount of teaching resources that a computer can offer within the classroom context (Axelson, 1996). Teachers have been able to design language arts programs in their very own classrooms. Computers can also assist teachers in creating individualized lesson plans for those students who need enrichment activities or a slower pace (Hickey,1993). The classroom computer can also be integrated into any subject area using the teacher's own objectives (Hickey,1993). Overall, teachers find that classroom computers reinforce learning, offer practice and enrichment activities and academically encourage students (Hickey,1993).

The value of classroom computers is not limited to academic success. Researches have found that the computer can aid in the social growth of faculty and students. In a 1994 study, Whitehead found teachers with computer equipped classrooms felt a great deal of ownership over their classroom technology. This sense of "ownership" as well as the success of classroom computers tended to permeate throughout the schools causing other teachers to inquire about computers for their own classroom use. Overall, school involvement was enhanced through the use of classroom computers, often bringing different ages and grades together. Teachers also found that through student-paired instruction, classroom computers enhanced cooperative learning among their students.

For the younger elementary grades, classroom computers can also aid in effective time and behavior management. Whitehead (1994) cites that computer lab scheduling can be burdensome with so many grades competing for a time slot in the lab. Classroom computers eliminate this issue and students are guaranteed use of computers throughout the day (Bramble & Mason, 1985). In addition, with classroom integration, teachers are able to avoid time consuming transitions to and from the lab and gain more instructional time on the computers (Bramble & Mason, 1985). Less transitions allows for more instructional time for teachers and increased time on-task for students (Roberts, Friel, & Miller, 1988). Classroom computers also assist teachers in effective behavior management. Many teachers claim that having a computer in their classroom is like having an aide because of their individualized instruction and direct feedback (Whitehead, 1994).

Computer Lab Use

The argument for the use of computer labs in schools is based on the premise that classroom integration does not work. Researchers note that the failures of the computer integration approach are due to the lack of technological expertise of classroom teachers, use of poor quality software and hardware, and the inequity of computer resources.

The biggest concern of computer lab supporters is that classroom teachers lack the training and knowledge of lab technicians. According to researchers, classroom teachers need to know how to integrate software into their curriculum (Maddux, 1991). Effective integration involves a solid background in computers

as well as an updated understanding of new software programs available. Only select schools are offering technology training programs and many teachers are not gaining expertise by other means. One study found that teachers were using their classroom computers only occasionally and when they were used they were not integrated into the daily lesson plans, but rather used in isolation as a reward or during extracurricular activities like recess (Hickey, 1993).

Researchers also find the lack of good, quality software a problem in schools. They fear that because most computer programs emphasize memorization and drills, higher-level thinking will lose its stature in the classroom (Maddux, 1991). Researchers also fear that a stronger emphasis on "drill and practice" programs may cause students to become bored with computer instruction and lose interest (Maddux, 1991, p.37). In addition, software programs seem to have been growing exponentially over the past few years, while software quality has been lagging far behind (Maddux, 1991). Therefore, teachers may be choosing inadequate programs for their classrooms because they do not have the technological expertise to differentiate strong programs from the weaker ones.

With the increased support of computer integration many school computer labs are being broken down to accommodate classroom needs. This has made "computer equity" (Maddux, 1991, p.37) a problem as computers are not being evenly distributed throughout schools. The numbers of computers in schools are not consistent and therefore some schools are leaving classrooms empty handed (Maddux, 1991). Integration, in this case, would only limit

computer usage. Computer equity involves equal numbers of computers in schools, but also like models. Many schools have old models or computers that have been passed down from other grades and schools, limiting the type of programming available (Whitehead, 1994).

Computer laboratories offer services that a classroom setting can not. They often provide a qualified technician that can run computer classes as well as assist teachers in technological choices. In addition, they are in a central location which students and faculty can utilize for large group activities, such as the production of school newspapers, computer clubs, and class projects (Roberts, Carter, Friel & Miler, 1988). Lab hours can also be extensive, offering before and after school open hours for faculty and students (Roberts, Carter, Friel & Miller, 1988). These labs are described as the, "greatest use, in terms of hours per school day, of a scarce resource." (Robert, Carter, Friel, & Miller, 1988, p.17)

The issue of computer location needs to be further examined through student perspectives. There are strong arguments for both in-class and computer lab approaches, but a more reliable measure of the effects of computer location would involve examination of student attitudes towards both settings. This information would isolate specific factors, in each placement, that effect student interest and learning. The amount of time on computers must also be explored in both contexts to determine which context affords the best use of instructional time.

Enjoyment

In attempting to understand whether or not students enjoy working on computers, and in which settings they enjoy them most, several factors other than the location of the computers must first be examined . The first is the amount of control that the student has over the computer. Second is the pre-conceived notions of what constitutes computer-work by their teacher. The third is whether or not the child is using developmentally appropriate software on the computer.

Studies show that if a child has control over using computer programs on their own, they are more likely to enjoy working on it (Liu, 1996). Min Liu conducted surveys of children's reactions to using computers and various software. She found that "allowing children to have control over the program is an important factor to keep them interested" (Liu, 1996, p. 71).

Teachers' ideas about computer use are also important to consider when looking at a child's enjoyment of computers. If the learners' teacher is uncomfortable using the computer, the learners will be more likely to feel the same. Roberts, Carter, Friel, and Miller (1988) studied the integration of computers into the elementary and middle schools. They found that teachers, in many instances, did not feel comfortable using computers, and therefore some "computers were undoubtedly kept in closets, which is a disadvantage" (Roberts, Carter, Friel, & Miller, 1988, p.19).

Developmentally appropriate software is also important to a child's enjoyment of using a computer. Liu emphasizes the need to

find software that is developmentally appropriate for students to use (Liu, 1996, p. 71). If the child has developmentally appropriate software, they will have more control and confidence while using the program. Daniel Shade shares a similar view on developmentally appropriate software: "Developmentally appropriate software engenders a positive learning atmosphere for young children" (Shade, 1994, p.183). In effect, the child will enjoy working on the computer most in this setting (Liu, 1996, p.71), because if the programs are too difficult, the students give-up and if they are too easy, students are bored.

There are several other issues to address when attempting to find the enjoyment level of a child when using a computer. They include: gender issues, whether or not the child has a computer at home, and the amount of time that they use it at school. For the most part despite outside issues to a child's computer using enjoyment, the statistics are that most children love working on computers in any setting (Shade, 1994).

Researcher Daniel Shade found that: "many investigations of computer use by young children have reported that children like computers and are positively motivated to use them" (Shade, 1994, p.183). Shade adds that children enjoy working with a partner on the computer, but also thrive working independently. Peakview Elementary School studied the issue of student enjoyment of computers and found that 100 percent of the students surveyed, said that technology made them feel good about themselves (Wilson, Hamilton, Teslow, & Cyr, 1993). In acknowledging that most children do enjoy working on the computer, it is also important to know

whether the location of the computer in the school (in-class or in a computer lab), affects the child's enjoyment of using it.

In-Class Computer Enjoyment

Is there a relationship between children working on a computer in their class and their enjoyment of computers? Researchers have found that students enjoy many of the benefits of having a computer in their classroom (Shade, 1994). Students can be more independent on the computer in their classrooms, and they are not intimidated by the setting. Students also have the ability to work with partners on the computer, or independently. The computer in the classroom can enhance the curriculum taught by the teacher.

Children enjoy working independently on the computer, at their own time, and at their own pace. They are able to do this with a computer in their classroom. Daniel Shade found that " young children ... respond positively to the presence of a computer in their classroom" (Shade, 1994, pp. 177-178). He also states that "children need time alone with materials" (p. 203). When students have time to work on the computer independently, they become more comfortable using it, and therefore enjoy their time on it more.

Children also enjoy working in groups on the computer, another benefit of an in-class computer. Shade concluded that " computers (have the) ability to spark positive social interaction" (Shade, 1994, p. 203). The social time is just as enjoyable to students as the academic time. Children can use the computers during free-choice times, and often recess, with their friends. This makes for a comfortable, un-intimidating atmosphere for young children. Having

the access of a computer in the room, places it as a social tool, fun for students to use together.

In-class computers enhance curriculum for students. Therefore, it becomes an enjoyable option for learning. Shade (1994) offers an example of a child's enjoyment in using a computer program in their class: "Children become very excited when they discover they can have the computer read their story or add their own narration to a picture through an attached microphone" (p.178). This ability for students to enjoy their curriculum through the computer, is best accessible when having a computer in the classroom. According to Roberts and fellow researchers (1988), "It is easier for the classroom teacher to integrate computer activities into the curriculum, particularly if the classroom is organized around learning centers" (p.18). They also add that "the computer is available for use by both students and the teacher whenever it is appropriate, as opposed to the need to plan for in advance to reserve another room" (p.18). These conveniences give the teacher more leverage to integrate computers into the curriculum.

When Peakview Elementary school interviewed teachers and students about enjoyment of their computers, located in the classroom, there were very positive responses. Teachers commented that "technology often has a substantial impact on student attitudes toward school" (Wilson, Hamilton, Teslow, & Cyr, 1993, p. 164). One teacher said that her students asked "can I stay in at recess; can I stay late?" (p.164). The children's excitement about the computers was seen throughout the day, because having computers in their classroom, provided the accessibility of usage all day long. Many

other responses by students and teachers were that "motivation is high" (p.164), one child said that "if we didn't have technology everyone would be bored...there'd be nothing to do" (p.179). Overall, the study found a consensus on students extreme enjoyment of using computers in their classroom.

Computer Lab Computer Enjoyment

Min Liu (1996) and Daniel Shade (1994) have found that children enjoy working on computers, regardless of the environment. Yet, in the setting of a computer lab, there is evidence to suggest that there are both positive and negative responses to using computers in that environment. In a laboratory location, the negative impact on a child's enjoyment include more structure than when the computer is in the classroom; more drill and practice than when the computer is in the classroom; and finally, usually less time spent per week using computers when in a lab setting. The positive impact on children's enjoyment include the consistent regime of visiting the lab; assistance (in most cases) by a lab technician, if they need help; and control over the computer usage, even when the computer is located in a laboratory.

For children, one negative aspect of using a computer lab, which affects their enjoyment of usage is that there is more structure in a lab environment. Especially young children, enjoy free exploring on the computer. Within the computer lab environment, the idea of free exploration is less than when children use computers in their classrooms. Min Liu's study using a computer lab environment, found that "allowing students to have control of the program is

important" (Liu, 1996, p.71). Students need this ability to explore on their own even when they are using a computer lab environment.

In order for children to enjoy working in a computer lab, the lab instructor must be sure (especially for young students) that he or she is not at all times drilling the students. In his 1994 study of computer lab usage, Daniel Shade found, that "developmentally appropriate software engenders a positive learning atmosphere for young children and is thus more appropriate than drill" (p.183). In cases of computer lab settings, he found that "children exposed to drill software displayed none of the developmental gains and showed a significant decrease in creativity" (p.183). As long as there is not excessive "drilling" taking place in the lab settings, young students will enjoy the experiences in the lab and benefit from them.

Although there are negative effects on a students' enjoyment of computer use in a lab setting, there are also positive ones. Consistency is one positive factor. Students know that they have a set time and place where they will work each week. Therefore there is little anticipation of the event, and students are less intimidated in this environment. Researcher Min Liu found students "excited and eager to go to the room" (Liu, 1996) at their time for lab. Knowing that they have this set time and place for lab work, allows positive anticipation of the experience.

The ability to have assistance from a lab technician, if a child needs help, is also an enjoyable factor for young children, when using computer labs. In most cases, there is a technology assistant present in computer lab situations. This person is able to answer questions and guide children through the computer programs. The assistant

should also be selecting the appropriate programs for students to use. If children are using developmentally appropriate programs, they will be more likely to enjoy their experiences on the computer (Liu, 1996, p.71). If all of these aspects of a technology coordinator are being facilitated appropriately, then there presence in a lab setting is a positive feature for students.

In Liu's study, using groups of children in a computer lab setting, children were asked if they enjoyed their time in the lab. Liu found that out of twelve students surveyed, "all said that they enjoyed using the program and ... asked when they could do it again" (p.84). In Liu's setting, children were able to both free explore on the computer and were guided by instructors (without drilling them). The combination was successful, and was enjoyable to all those who participated. Liu's set-up of a computer lab is an appropriate set-up if a computer lab setting is used by a particular school.

Time Used

A child's enjoyment of computers is also dependent on the amount of time that he or she spend on a computer every week. Research shows that there are many inconsistencies in computer usage. (Brummelhuis & Plomp, 1994), it varies drastically by teacher and school. The inconsistencies might come from the available number of computers, the teacher's notions about computers, the school-system's technology requirements, or the location of the computers within a school.

In-Class Computer Time Usage

There are both positive and negative affects on the amount of time spent using computers located in the classroom. To begin, if teachers do not feel comfortable using the computer that has been placed in their room, the children will most likely not use the computer frequently. Alfons ten Brummelhuis and Tjeerd Plomp's research of computer usage in various countries have found that "computer usage depends upon the individual teachers" (Brummelhuis & Plomp, 1994, p.291). Specifically, they found that "on average 75% of the teachers ...who are employed by a school in the possession of computers actually make use of these computers in the classroom" (p.293). This leaves concern for the other 25% of teachers who are not using their computers. More in-service training of teachers will make them more comfortable in using them in their classrooms.

When computers are being used in the classes, there is evidence that they are used frequently (Liu, 1996). Because there is no "set" time when the computers have to be used, there is no "set" time that a child must get off the computer, and teachers are trying to integrate the computer into their everyday curriculum. Wilson, Hamilton, Teslow, and Cyr (1993) reported on one school that had computers in the classroom and another that had a computer lab. They found that the students in the primary grades who went to the computer lab "reported using the labs only 'once in awhile'" (p.97). The schools that had computers in their classrooms reported using them more frequently. When the in-class computer teachers were

interviewed, all expressed a preference for having the technology in the classrooms. According to Roberts and fellow researchers, "it is far easier for the classroom teacher to integrate computer activities into the curriculum" (p.18), and that the computer "is available for use by both students and the teacher whenever it is appropriate" (p.18).

Teacher responses to having computers in their classrooms were very positive. They expressed that the computers were being used frequently. The teacher responses included: "having the computers in the classroom provides a much more efficient way of utilizing computers as a means to facilitate learning" and that "the classroom-based technology structure is in constant use" (p.97). The consensus is that teachers are integrating computers into their curriculum, and students are using them constantly throughout the day. There is no beginning time and no end therefore, students can feel free to explore and stay-on as long as they are permitted.

Laboratory Computer Time Usage

If a school's set-up has a computer lab rather than computers in the classrooms, the amount of time spent on them will be more consistent if scheduled rigidly. These have both positive and negative implications on the amount of time students are using the computes.

There is consistency in using a computer lab; the time that a class comes to the lab is usually the same every week. Evidence suggests that most classes visit the computer lab "once a week" (Wilson, Hamilton, Teslow & Cyr, 1993, 97). Yet, this "once a week" is not specific. Are students in the lab for one hour per week, or thirty

minutes per week? Usually the scheduling permits a sign-out of about one hour per week, but there is time wasted both going to the lab and leaving the lab. Much of the hour is used in preparing students for computer lab and preparing them to leave the lab. Therefore, while one hour is written as the time per week, it is actually less.

According to Roberts and fellow researchers (1988), the computer lab is time beneficial because it "provides the greatest amount of time flexibility for the range of student needs in elementary and middle schools" (p.17). This is easily debatable by researchers who are in favor of the classroom approach, because the flexibility usually lies with the classroom teacher, and not the lab. They also found that time is increased if classroom teachers offer both pre/post lessons in their own classroom (Roberts, Carter, Friel & Miller, 1988). Whether or not these pre/post lessons are actually being done is uncertain.

Computer labs also have benefits, for students with regard to time on task. It is easier to make sure that labs are actually being used by classes, especially if there is a technology coordinator present in the lab. When computers are in the classroom, it is not definite that they will actually be used. In a lab setting computer usage can be more closely monitored. If the lab schedule is set for the entire year, then it can be assumed that there is consistency in using the lab. When computers are in the classroom, students might go through periods where they are not using the computers as much as they were at other times of the year. In a lab setting, students are actually using the computers during a regularly scheduled time each

week. A final benefit to the computer lab is that time spent on the computers in a lab setting is usually intense. Students work on the computer for the set time, without interruptions, and therefore most likely have a valuable experience with each visit.

Conclusion

In conclusion, research shows that in almost all settings of computer usage "children like computers and are positively motivated to use them" (Shade, 1994, 183). There are both positive and negative aspects to using computers in each setting, but what seems most important especially at this level, is that children are using the computers frequently and in meaningful situations. A first grade child should be comfortable using the computer for an extended period of time, and should become acquainted with its' uses (because this is an introductory time for them). Therefore, it is important to determine how often students are using computers in lab settings and how often they use them in classroom settings. It is also essential to ask the students of these two settings how they feel about using computers in the difficult settings. The purpose of this study is to do just that.

Methodology

Computer Lab

Participants and Setting

The sample in this study consisted of 30 first grade students from Burnley-Moran Elementary School a middle to lower middle class SES school, in Charlottesville, Virginia who attended a computer lab class once a week. The students were from two different first grade classes and combined into two separate computer lab sessions. Computer lab class A had 13 students, five boys and eight girls, and computer lab B had 17 students, 12 boys and five girls. The lab was proctored every week by two Burnley-Moran teaching assistants who were not certified as technology educators.

Both first grade classes attended a 45 minute computer lab class once a week facilitated by two teaching assistants. The lab design included 24 modem equipped, internet accessible computers in four rows of six computers. Each student was assigned one computer during the duration of their weekly lab session. In addition to its 24 computers, the lab contained two large dry erase boards, a larger computer with a TV attachment for lesson demonstrations, two printers, twenty headphones, computer posters and three student computer projects on the wall.

Instrument

In order to determine the amount of time the students spent on actual computer lab instruction, a computer lab log-in sheet was developed (Appendix A). Using the log, the researcher tracked the exact time each computer class entered the lab, when instruction began, when instruction ended and when the class left the lab. Thus,

the researcher was able to calculate the actual amount of computer instructional time in a given lab session, while isolating this instructional time from the classes' transition time in and out of the lab setting.

Procedure

The researcher performed four systematic observations, two in each computer lab section, over a period of two weeks. The purpose of the four systematic observations was to note the amount of instructional time and on-task behavior observed during a computer lab lesson. The researcher defined on-task behavior when students demonstrated any of the following qualities: working at their computer on given materials, raising hands with questions, and attention to the lab instructor when receiving directions. Off-task behavior was defined as working on non-related material (i.e. another computer program), talking when instructed not to, and exhibiting un-excused out of seat behavior.

The duration of the lesson was noted using the computer lab log-in sheet. The computer log-in sheet was created and integrated by the researcher for the first two weeks of data collection. The instructional assistants completed the log-in sheets for the following week of computer lab class, indicating when the class entered the lab, when the lesson began, when the lesson ended and when the class left the lab. The researcher and lab assistants made sure to note any absence or tardiness during a given lab session on the computer lab log-in sheets.

Scoring

At the completion of each systematic observation for each lab class, the researcher calculated the amount of time (in minutes) each class spent on the instructional portion of the lesson. This instructional time was used to estimate how long, during a given lab period, the students were working on the assigned computer lab lessons.

In-Class Computer

Participants and Setting

The sample was composed of 19 first grade students. 12 students were from one first grade class, and the other seven came from another first grade class at the same school. All students attended Woodbrook Elementary School, a middle SES school in Albemarle County in Charlottesville, Virginia. The sample of students from Class A were composed of five girls and seven boys. The sample of students from Class B were composed of three girls and four boys.

Both Class A and Class B had two Macintosh Computers in their classrooms. Both computer lab and in-class computer content was academic based. The philosophy of teaching of both Class A and Class B with regard to computer usage was that students are able to use the computer whenever they choose throughout the day. Students used computers even during direct instruction by the teacher. The only exception to this rule was during gym class, music, art, lunch, snack time, and recess. Both classes have a schedule where three students per day must complete their writing for the day on a

computer. Otherwise, the computers are available for any student to use the remainder of the day.

Instrument

In order to determine the exact amount of time that first grade students, who have computers in their classrooms were on the computer each week, a time log was created for both Class A and Class B. The log was color coordinated according to the class. Class A had pink logs and Class B had green ones. A digital clock accompanied each log. The logs were placed in between the two computers in each room. They were placed on clipboards with a pencil attached to each clipboard. The digital clocks sat next to the clipboards, so that students would be reminded to log in and out every time they used the computer. Each log had several blanks for students to write their name, "time in" and "time out". At the top of each page in the log books were examples of how to sign in and out correctly in the log book. The logs were replaced at the start of each new week, so that weekly time counts would be efficient.

Procedure

Two days before the students began using the log books, the researcher met with each classes sample of students, separately to discuss the procedures. In the discussion, the researcher did a short lesson with the students demonstrating how to read the digital clock, how to sign their names, how to "log in", and how to "log out". Each student practiced logging in and out on their own piece of paper, which the researcher had prepared for the students. After the researcher observed each student correctly "log in" and "log out", she showed the students where the log and clock would be kept, and

emphasized the importance of looking at the clock when they got on and off the computer.

Because the participants in this study were first grade students, the researcher had to be sure that the log books would be consistently used. Therefore, she asked the teaching assistants in both classrooms to assist students in signing in and out. The researcher also asked one child from each sample to be in charge of making sure that all students were signing in and out of the log book at all times.

The log books were used consistently for three full weeks. In the first week, there were two school days missed due to severe weather. In the second week there was one day when the electricity was not working. These days missed were not averaged into the weekly average of time spent on the computers. The total number of days data was collected was 12. Students consistently signed in and out of the log books and both the teaching assistants and the assisting students corrected the log book when necessary.

Scoring

After obtaining results for three weeks from Class A and Class B, the researcher kept track of the actual amount of time that all 19 students had used the computer for each week (Appendices B & C). The researcher also did an average of the amount of time spent per class/per week on the computer. Weekly averages were necessary in the event of a student's absence for portions of particular days when the logs were used. Charts were made in order to track each child's time spent on the computer, each week for three weeks.

Survey Methodology

The researchers developed a questionnaire to determine first grade enjoyment of computer usage. Items number 2 and 3 were borrowed from interview questions asked in a study by Wilson, Hamilton, Teslow, and Cyr (1993): "Evaluating the Impact of Technology at Peakview Elementary School". The remaining 6 questions were developed by the researchers of this study, items (1, 4,5,6,7,8,&9) (Appendix E).

Pilot

The survey was piloted at Clark Elementary School. To ensure that the questions were at the appropriate developmental age of first graders, the survey was given to 15 first grade children at an inner-city school in Charlottesville, Virginia. Results from the pilot survey indicated that no modifications were necessary for administering the survey at Woodbrook Elementary and Burnley-Moran Elementary schools.

Procedures

The survey was initiated by researchers to nineteen first grade students at Woodbrook Elementary School in Charlottesville, Virginia (the same students who participated in the in-class computer log-in portion of the study. The same survey was given to twenty-eight first graders at Burnley-Moran Elementary School in Charlottesville, Virginia, who were observed by the researchers during their computer lab classes.

The researchers gave the surveys to groups of four or five students at a time. Students were told instructed to complete the

surveys independently. Researchers read each question out-loud, one-by-one, to ensure understanding and accommodate non-readers. Students circled the answer that they felt most appropriate for each question. Students were asked to turn their papers over when they had completed the questionnaire.

Results

Computer Lab

Instructional time for each computer lab class was the actual amount of time, in lab class, during which the lesson was given, this excluded transitions in and out of the lab and free choice time. Class A averaged 36 minutes of instructional time during the three week data collection period, while class B averaged only 29 minutes. The amount of on-task behavior, during lab instruction time, was tabulated for each student in both classes. During week one, on-task behavior time in class A ranged from 20-35 minutes and averaged 27.5 minutes during their 37 minute instructional time, while on-task behavior time in class B ranged from 10-30 minutes and averaged 22 minutes during their 31 minute instructional time period. During week two, on-task behavior time in class A ranged from 20-30 minutes and averaged 26 minutes during their 38 minute instructional time period, while on-task behavior time in class B ranged from 10-25 minutes and averaged merely 19 minutes, during their 26 minute instructional time period. Week three, Class A had an instructional time of 35 minutes, while class B had an instructional time of only 32 minutes. The total instructional time for all students in both classes for week one was 971 minutes, during week two both classes totaled 936 minutes and 999 minutes during week three.

Results for In-Class Computer Time

Computer logs were used for three weeks, and data was collected for 12 days. The students were very consistent about signing the log book after the first week, but during the first week,

the data was not entered as consistently as it was during the last two weeks of data collection. It took about one week for students to become used to signing in and out of the log books. In Class A the researcher had to account for one week of absences of two different students, and in Class B there was one child absent for 1 week.

The results for week one indicated (Appendices B & C) that, in Class A approximately six out of 10 students used the computer for at least one hour during week one. Approximately four of those students were on the computer for nearly to two hours or more. In Class B, the results were similar. Four out of the six first grade student participants were on the computer for approximately one hour during the first week, and two of those students were on the computer for approximately two hours. For the first week, Class A's average time on the computer per child, was 81.3 minutes. Class B's average time on the computer per child, was 72.8 minutes for the first week.

For week two of surveying the amount of time each class was on the computer, the results were more consistent. For Class A, 11 students out of 12 were on the computer for approximately one hour or more. Nine of those students were on the computer for more than two hours in one week, and 7 students were on the computer for three hours or more that week. For Class B, all seven of the first grade student participants were on the computer for at least one hour during the second week. Four students were on the computer for at least two hours that week. The class averages during the second week were significantly higher than they were the first week. Class A averaged 168.75 minutes on the computer, per child for

week two, and Class B averaged 125.7 minutes on the computer, per child.

During week three, all students in Class A were on the computer for at least one hour six of 11 students were on the computer for at least two hours, and four students were on the computer for approximately three hours that week. In Class B, all students were on the computer for at least 45 minutes during that week. Four out of six students were on the computer for at least one hour, and two students were on the computer for approximately two hours that week. Class A's average time on the computer, per child, in the third week was 134.27 minutes while Class B's average time on the computer, per child, was 74.28 minutes per week.

In assessing the data for all three weeks of using the computer log-in books, different patterns were revealed with students in each class. For Class A, the majority of the boys were on the computer longer than the girls in the class specifically, seven boys compared to 5 girls were on the computer for two hours or more in the second week. One boy was on the computer for at least three and a half hours per week, all three weeks. Although three of five girls spent a significant amount of time on the computers each week. The majority of computer users were the seven boys.

For Class B, there were no patterns according to gender of the students. Two of the seven students in Class B were the most frequent users of the computer. With only two computers in the classroom, they may have monopolized the computers on most days. Overall, the students in both classes were using the computers in their classrooms for a considerable amount of time each week.

Survey

A survey on computer enjoyment (Appendix E) was given to a total of 47 students, 19 from Woodbrook Elementary School and 28 from Burnley-Moran Elementary School. The Woodbrook sample of students that use computers in their classrooms only, will be referred to as "in-class computer students." The Burnley-Moran sample attends a weekly computer lab session and will be referred to as "computer lab students."

In order to compare the in-class computer student surveys with the computer lab student surveys, student responses for each of the survey items were totaled separately for both the computer lab student sample and the in-class student sample (Appendix F).

There was no difference regarding enjoyment of computers found between in-class computer students and computer lab students; 18 out of 19 in-class students agreed that they liked computers and 26 out of 28 computer lab students also agreed that they liked computers. There was no difference found between the two groups on whether computers increased interest in school, nine out of the 19 in-class students said computers made them like school more, while 18 out of the 28 computer lab students said the same. Students perceptions of computers as a learning tool indicated that in-class computer students believe more strongly in the role that computers play in helping them learn. Only three of the 19 in-class computer students did not believe that computers helped them learn compared with nine out of 28 computer lab students. More computer lab students than in-class students wished they had greater access to

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computers while in school. In fact, 22 of the 28 computer lab students wished they could use computers at school more often.

The perceptions of in-class computer students and computer lab students regarding their classmates' use of the computer on a daily basis differs significantly. Thirteen of the 19 in-class computer students believed that their class uses computers everyday compared with only one of the 28 computer lab users. Fourteen of the 28 computer lab students are hardly ever using the computer in their classroom, whereas only five of the 19 in-class computer students are hardly ever using the computer in their classroom. There was no difference found between in-class computer students' and computer lab students' perceptions of whether they believed their teacher liked computers. Furthermore, 16 of the 19 in-class computer students have computers at home, while only 17 of the 28 computer lab students have computers at home. Lastly, all sixteen of the in-class computer students use the computer they have at home, while four of the computer lab students who have a computer at home do not use it.

Discussion

The results for the computer lab classes indicated that class A and class B averaged only 36 and 29 minutes of instructional time per week, respectively. When taking into account on-task behaviors during instructional time, class A and class B averaged only 26.75 minutes and 20.5 minutes of on-task behavior per week during computer lab time. This suggests that during the allotted 45 minutes of computer lab time a week, students are only exhibiting on-task behavior for less than thirty minutes of their computer lab time.

In-class computer data suggested that students in class A are spending 128 minutes per week on the computer, and students in class B are spending 92 minutes per week. As observed by one researcher, in-class computer students exhibited on-task behaviors throughout their allotted time on the computer.

Data examining usage of computers in computer lab and in-class settings indicated that students spend significantly more time on computers when they are located in their classrooms (Appendix D). Despite access to fewer computers, the in-class sample was on the computer for a total of 1,250 minutes in the first week. Compared with computer lab students who were on the computer for a total of 971 minutes for week one. During the second week of data collection, in-class computer users were on the computer for 2,905 minutes and computer lab students were on the computer for 936 minutes. For the final week, in-class computer students were on the computer for a total of 1,997 minutes and computer lab users were using computers for a total of 999 minutes. The total minutes for all in-class computer users, for 12 days was 6,152 minutes with 2,906

minutes of computer use by computer lab students during three weeks of data collection. The difference is even more significant when considering the in-class computer student sample of 19 students versus the computer lab student sample of 30 students. Furthermore, each computer lab student averaged 96 minutes on the computer for the ***three*** week data collection period whereas the in-class computer sample averaged 91 minutes in ***one*** week. Therefore, it would take three weeks of computer lab class for each lab student to spend the amount of time on computers that the in-class computer students spend in one week.

In addition to computer usage in the computer lab and in-class settings, researchers surveyed student enjoyment of computers. Survey findings identified computers as enjoyable for students in both lab and in-class settings. However, students perceptions of computers as a learning tool indicated that in-class computer students believe more strongly in the role that computers play in helping them learn. This may be due to the constant exposure that in-class students have to computers as an integral part of their classroom framework. The survey also suggested that computer lab students wished they had greater access to computers in school. The limited amount of time computer lab students spend on computers each week may account for these feelings. The perceptions of in-class students and computer lab students regarding their classmates' use of the computer on a daily basis showed a significant difference. The majority of in-class computer students perceived their classmates using the computer everyday while only one computer lab student felt this way about his classmates. The perception of the

in-class students may be related to the consistent use of computers in their everyday, in-class instruction. Another significant survey finding highlighted 84 percent of in-class computer students with computers at home compared with 60 percent of the computer lab students having computers in their homes. Inequities in computer ownership for students in both settings may be due to socio-economic difference between the two student populations.

Limitations

Limitations for the research in the computer lab setting were associated with the systematic observation portion of data collection. The researcher confronted issues of student absences, tardiness, behavior disturbances, and frequent bathroom breaks. These disruptions caused inconsistencies in data collection of on-task behavior. The in-class researcher had several limitations to her data collection. During the three weeks of data collection, there were three days where school was closed for in climate weather. Therefore, students had breaks during each week of data collection and had difficulties readjusting and remembering the computer log-in routine. Furthermore, three out of the 19 students sampled, took week-long vacations during the data collection period and could not be counted during their absences. Another possible inconsistency in data collection for the in-class researcher was the possible mistakes by students in logging-in and out of the log books. If the researcher had started the students logging-in a week before she began collecting data, the results may have been more reliable for the first week of data collection. Also important to note in both computer settings, is that the philosophy of the classroom teacher and the

school may determine the amount of computer time per child per week.

Future researchers interested in this project could examine: issues of gender inequity in computer settings, racial differences, teacher efficacy and training in current technology, effective collaboration between computer lab instruction and computer integration, and effectiveness of educational computer programs.

In conclusion, researchers find that computer usage is higher for first grade, in-class computer settings in which teachers are allowing students to use the computer frequently throughout the school day. Our survey has shown that students enjoy computers in both settings, but those in computer lab classes wish they could use computers at school more often. If teachers are concerned with the amount of time that their students are on computers, it is recommended that they place a computer in their classroom.

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Appendix A

Computer Log in Sheet

First Grade-Wasch/Davis

Date	Enter Lab	Lesson Begins	Lesson Ends	Leave Lab
_____	_____	_____	_____	_____
absences:				
_____	_____	_____	_____	_____
absences:				
_____	_____	_____	_____	_____
absences:				
_____	_____	_____	_____	_____
absences:				
_____	_____	_____	_____	_____
absences:				
_____	_____	_____	_____	_____
absences:				
_____	_____	_____	_____	_____
absences:				
_____	_____	_____	_____	_____

Appendix B

Data for weekly In-class times:

Class #A:	Week #1	Week #2	Week #3	Total
Di	20 min	148 min	260min	428min
D	294min	353 min	215 min	862min
P	88min	180 min	120 min	388min
T	7 min	185 min	65 min	257min
C	100 min	146 min	229 min	475min
Ky	108 min	278 min	169 min	555min
K	20 min	43 min	92 min	155min
T	70 min	145 min	Absent	215min
D	46 min	226 min	132 min	404min
Mp	60 min	178 min	60 min	298min
M	absent	90 min	70 min	160min
J	forgot to sign	53 min	65 min	118min
	81 min	2025 min	1477 min	4315 min total

Appendix C

Data for weekly In-class times:

Class #B:

	Week #1	Week #2	Week #3	Total
E	76 min	70 min	69 min	215min
J	108 min	122 min	140 min	370min
C	127 min	145 min	111 min	363min
E	36 min	262min	50 min	348min
Eth	52 min	71 min	45 min	168min
B	38 min	120 min	60 min	218min
T	Absent	90 min	45 min	135min
	437 min	880 min	520 min	1817 min

Appendix E

NAME_____
circle your answers please

1. I like computers ...

agree disagree

2. Does using computers make you like school more or less?

more same less

3. Using computers in school will help me learn:

A lot more the same as not having them A lot less

4. I wish I could use computers at school...

More Same Less

5. My class uses computers...

every day every week every month hardly ever

6. In my class I use computers

everyday every week every month hardly ever

7. My teacher likes computers

agree disagree

8. I have a computer at home

yes no

9. I use the computer that I have at home

yes no

Appendix F

Results for survey on computer enjoyment

In-class sample size:19 Computer lab sample size:28

1. **I like computers:**

In-class	Computer lab
agree: 18 disagree:1	agree: 26 disagree: 2

2. **Does using computers make you like school more or less?**

In-class	Computer lab
more: 9 same: 7 less: 3	more: 18 same: 6 less: 4

3. **Using computers in school will help me learn:**

In-class	Computer lab
more: 16 same:1 less:2	more: 19 same:3 less:6

4. **I wish I could use computers at school:**

In-class	Computer lab
more:11 same: 4 less:4	more: 22 same:4 less:2

5. **My class uses computers:**

In-class	Computer lab
every day: 13 every week: 6 every month: 0 hardly ever: 0	every day: 1 every week: 25 every month: 1 hardly ever:1

6. **In my class I use computers:**

In-class	Computer lab
every day: 6 every week: 7 every month: 1 hardly ever: 5	every day: 2 every week: 11 every month: 1 hardly ever:14

7. **My teacher likes computers:**

In-class	Computer lab
agree: 16 disagree:3	agree: 25 disagree: 2 omit: 1

8. **I have a computer at home:**

In-class	Computer lab
yes: 16 no:3	yes: 17 no:11

9. **I use the computer that I have at home:**

In-class	Computer lab